SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1225.—Vol. XXIX.] LONDON, SATURDAY, FEBRUARY 12, 1859. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

THE PATENT LAW, AND ITS REFORMERS.

One of the most difficult species of argument to contend against is that in which the attention of the disputant is designedly drawn from the question at issue, and fixed upon some unimportant object, either altogether irrelevant, or with respect to which the hearer is uninformed. A meeting has recently been held at the Town Hall, Manchester, under the auspices of the Patent Law Reform Association, for the purpose of adopting a petition "to Parliament to allow the surplus fund arising from the stamp duties on patents to be appropriated to scientific purposes, and for other amendments in the existing laws." But much as we desire to see invention and inventors encouraged, we maintain that the demands of the supporters of the Patent Law Reform Association are as unreasonable as they are uncalled for. It is altogether a mistake to think that the present Government charges for patents offer any obstacle to the inventor; but if we would arrive at the truth, we should rather consider the causes which prevent the development of patented contrivances, and we shall find that by far the greater number of provisional specifications filed are either for things which are not new, or for inventions of such a character that one is inclined to doubt the sanity of a man who would propose them.

Rejecting, however, for the present all consideration of patents, with the exception of those practically useful, who would venture to assert that the cost of the patent is the real obstacle in the way of the inventor? We unhesitatingly affirm that the inventor has in most instances himself alone to thank for his want of success. The total amount payable at the office of the Commissioners of Patents to secure the monopoly of an invention for three years is 25*l.*; at the end of which term another 50*l.* is payable, which secures the invention for four years longer, when the remaining 100*l.* has to be paid, to establish the right during the remainder of the term of fourteen years, for which the patent is granted. On application for protection 5*l.* only is payable, although it is well known that, owing to the rapacity of patent agents, the inventor often pays double that sum, but this is the inventor's fault. If the inventor feel satisfied that the discovery can be worked with profit to himself, he has to pay the remaining 20*l.*, to complete the patent and secure him for the first three years; this, from the same cause, is frequently charged 30*l.*, whence some have urged that reform in patent agents is more needed than reform in patent law. But be this as it may, how many patents are allowed to sink into obscurity, not because there was any difficulty in obtaining the funds for taking out the patent, but because the nature of the invention necessitated so enormous an outlay to develope it that the patent was practically valueless. Mr. Fairbairn, C.E., who presided at the Manchester meeting, stated that in 1852 the cost of taking out a patent was, mainly through the exertions of the Patent Law Reform Association, reduced from 500*l.* to 175*l.*; and that, notwithstanding this reduction, a considerable surplus of receipts over expenditure remained at the Patent Office each year, and that it had gone on increasing yearly until it amounted last year to 94,167*l.* Now, as the last published report extends only to 1857, when the surplus was but 21,280*l.* 5*s.* 6*d.*, we presume that Mr. Fairbairn must have been in error; and even giving him the advantage of 1858, which can only be estimated, we do not think it could much exceed 50,000*l.*, thus—

RECEIPTS.					
Stamp duties, in lieu of fees	£85,000	0	0		
Sale of printed specifications, abridgments, indexes, &c.	2,219	14	6		
Surplus income to end of 1857	21,280	5	6	= £108,500	0 0
PAYMENTS.					
Fees to law officers of England, and their clerks	£10,000	0	0		
Salaries and compensations in Commissioners' office	10,000	0	0		
Current and incidental expenses	10,000	0	0		
Stationery, books for library, &c.	1,000	0	0		
Rent of offices and library	490	0	0		
Printing specifications, indexes, & lithographing drawings	20,000	0	0		
Cost of paper for same	3,000	0	0		
Expenses at South Kensington Museum	2,510	0	0	= 57,000	0 0
Balance				£ 51,500	0 0

With regard to Mr. Fairbairn's statement, as to the parties to whom credit is due for having assisted in bringing about the amendments in the patent laws in 1852, it should be recollected that the self-styled Patent Law Reform Association was but one of many similar associations. If it was "mainly through the exertions of the Patent Law Reform Association" that the change in the law was effected, how came it to pass that none of its members were examined before the Parliamentary Committee? while it is notorious that it was in accordance with the views of witnesses in no way connected with that body, and differing from its most essential views, that the two Bills introduced by Lords Brougham and Granville were modified and shaped into their present form—that of the Patent Law Amendment Acts of 1852 and 1853.

Mr. Fairbairn continued that it had been stated that the Chancellor of the Exchequer had no objection to apply this surplus to scientific purposes. A large amount would be required for building new patent offices; but if after that the Government were willing to apply the remaining funds to scientific purposes, and also to reduce the stamp duty upon taking out patents, he (Mr. Fairbairn) thought it would be better to allow the Government to make the change spontaneously, than to force them to do so by adopting petitions at special meetings. Mr. Hughes, a patent agent, read the proposed petition, which, after setting forth the grievances under which the petitioning inventors suppose they labour, prays that the following alterations and modifications should be made:—

That the future charges on taking out a patent should be 5*l.* on application for protection, 10*l.* for the warrant and seal, and 25*l.* at the expiration of five years.—That the stamp duty of 100*l.*, now payable at the expiration of the seventh year, be entirely abolished.—That the surplus funds (if any) arising from this scale of charges should be set apart for carrying out the Acts relating to patents for inventions, with the view of promoting the progress of invention and science.—That special commissioners, possessing scientific attainments, be appointed, as contemplated and provided for by the first section of the Patent Law Amendment Act of 1852, to assist the law officers of the crown in passing patents.—That these commissioners be required to report to the House of Commons, suggesting alterations or amendments when necessary.—That a special court be appointed to try patent cases, and that scientific persons, conversant with the subject, should be summoned as jurors, and their decision be final.—That a penalty be imposed on persons selling goods as patented which are not patented; and that some simple means be devised to secure patents for the colonies.

The petition was, on the motion of Mr. Thomas Hopkins, seconded by Prof. Crace-Calvert, adopted with one dissentient. Mr. Roberts, C.E., moved an amendment, that the whole charges for taking out a patent ought not to exceed 10*l.*, but his motion was not seconded. Now, we contend that the modifications prayed for are almost ridiculous, and we think any one reading the above abstract of it will concur with us. The fact of the case is this—Patent agents are too numerous, owing to the want of knowledge amongst inventors that the law is so simple that any inventor can secure a patent for himself without their assistance, and to the circumstance that beyond a slight knowledge of mechanical drawing no tuition is necessary to fit a man to engage in the "profession;" and each has, therefore, to resort to some mode of advertising to draw business to himself. The patent law reformers consider advocating (?) the inventor's cause a good idea. Now, as to the petition. We do not hesitate to affirm that if special commissioners were appointed, a special court created to try patent cases, and scientific jurors summoned, in accordance with the prayer, even twice the existing charges would be totally inadequate, not to speak of the reduced scale proposed by the petitioners.

In the performance of their duties, the Commissioners of Patents are actually doing too much to please the patent agents, in the way of rendering inventors independent of them, and therefore the attempt is made to keep them without funds; but we trust all such attempts will be unsuccessful. For some time the Commissioners have been preparing a series of abridgments of specifications, arranged in classes, according to the subject of the invention; thus, supposing a man to have invented a new steam-engine, he can for 1*s.* obtain abridgments of all patents which have been taken out relating to "Aids to Locomotion;" whilst another, who believes he has discovered an improvement in the manufacture of iron or steel, can obtain abridgments of all specifications of patents bearing upon that subject at an equally cheap rate. These abridgments are continually being made, and ultimately the specifications upon every subject will have been collated and condensed; and if we may judge by the ready way in which they are purchased by the public, we may conclude that the Commissioners' labours are fully appreciated by inventors.

In conclusion, we need only refer to the opinion we have expressed on a previous occasion, and remark that inventors would do well to receive our observations as a caution against being deluded by pretended friends. None more than ourselves desire the prosperity of the inventor and the encouragement of genius, but we are convinced that the steps now being taken by the Patent Law Reform Association are not likely to secure either.

As a proof that the present state of the law does not prevent inventions being patented, we may add the number of provisional protections allowed and patents granted for inventions connected with metallurgy only during the past year:—For reducing and smelting ores, and furnaces, 11; iron manufacture, 23; steel manufacture, 18; lead refining and making litharge, 9; copper and tin, 1; zinc, brass, and alloys, 18; refining and working of gold and silver, 5; tinning, coating, and plating metals, 7; casting metals, and foundry operations and apparatus, 13; rolling metals, 7; drawing pipes and wire working, 4; punching, die sinking, stamping, carving, and ornamenting, 15; sawing, planing, turning, and boring metals and wood, 26; sawing, planing, turning, and boring slate and stone, 4; pumps, 32; bellows, blowing machines, and forges, 11; rolls and cylinders, and printing rollers, 10; nails, bolts, screws, nuts, and rivets, 30; chain manufacture, 4; cutting of files and rasps, 3; and for various metallurgical operations not classified, 32.

TREVITHICK IN COSTA RICA.

UNPUBLISHED CHAPTER IN THE LIFE OF THE GREAT CORNISH ENGINEER.

It is now above ten years ago that the Institution of Civil Engineers offered a prize for a memoir of Richard Trevithick, but it has not yet been claimed, nor has anything appeared beyond the memoir contributed by Mr. Hyde Clarke to the "Mining Almanack" for 1849, a work which was published under the auspices of this Journal. In our pages have appeared the chief additions which have been made to the biography of this distinguished engineer.

The South American career of Trevithick is well known to be one of the great chapters of his life, but even that is only partially written. His chief mission was, it is well known, to Peru, of which the best account is that published by Mr. Boase, in the first volume of the "Transactions of the Cornwall Geological Society," page 212, though many particulars have since been obtained which will render this portion more complete. It is, however, with regard to his occupation after he left Peru, or from 1823 to 1827, that we now propose to offer a few notes. It may, however, be as well to give a brief account of his Peruvian career.

It may be remembered by those conversant with the name of Trevithick that Uvillé, a Spaniard resident in Peru, witnessing the great decline in the produce of the silver mines of that country, resulting from the deep workings and the want of mechanical power for drainage, conceived the project of introducing the steam-engine, and came to London in 1814. The physical and mechanical difficulties of such an undertaking were great, and he vainly applied to Watt, and other leading engineers of the day; but even Watt's inventive mind was checked by the prospect of an undertaking so distant, and presenting so many obstacles. It was supposed to be impracticable to work a steam-engine at the elevation of Pasco.

Uvillé was on the point of leaving England, frustrated of his object, when he chanced to see a finished working model of Trevithick's engine exposed for sale in the shop of Mr. Roland, in a street near Fitzroy-square. This he bought as a curiosity, or relic of his fruitless expedition, and carried home to the mountains of Pasco. When there he one day tried to set it in motion, and to his unutterable joy had the pleasure of witnessing its successful working. He now resumed his project, engaged other capitalists in it, and again started for England. On his voyage, talking with Mr. Teague, a fellow-passenger, of his anxiety to discover the inventor of the model, he was most agreeably surprised to hear Mr. Teague observe that "Trevithick was his near relative, and that he could bring them together within a few hours of their arrival at Falmouth." Trevithick's career abounded with such incidents, and with omens of good fortune, the realisation of which, after bright beginnings, was commonly loss or litigation.

Uvillé landed at Falmouth, went to Camborne, saw Trevithick, whom he induced to join him, and the steam-engine carried across the ocean by the adventurers, and then in small pieces on the backs of llamas over the Andes, was successfully erected at Lauricocha, and drained the No. 1 shaft of the Santa Rosa Mine. Trevithick returned to England for further supplies, and again left in Oct., 1817, for Peru, successfully prosecuted his enterprise, amid the plaudits of the vice-royalty, and is said to have been created a Spanish marquis, and as some say a grandee of Spain, but this latter honour is very unlikely. The Lord Warden of the Mines did seriously propose to raise a statue of Trevithick in massive silver.

The proceeds of the mines rapidly increased, and Trevithick appeared on the way to wealth; but a change came over the bright scene of his glory, for the revolutionary war proceeded, and Trevithick himself became an object of contention in the bitter conflict. The patriots kept him up in the mountains as a kind of patron and protector, and the royalists looking upon Trevithick as the great means whereby the patriots obtained the sinews of war, ruined his property wherever they could, and mutilated his engines. His share in the grants of the silver mines was disposed of for current supplies at a low rate, and the mines of which he had denouncements were alienated from his inability to work them, and thus he lost his property, while he was retained in a state of honoured captivity by his admirers. It is said that he had to make his escape, and after great difficulties succeeded.

He then visited various parts of the west coast, but it appears that the last four years were chiefly spent in Costa Rica, in the countries now so well known as the route of the Nicaraguan transit, and the scene of General Walker's filibusteer warfare. He engaged in mining in that part of Costa Rica, and in the course of his explorations laid down several important projects, none of which he was destined to see realised. One of these was naturally the passage of the isthmuses, which was a subject which even at that time attracted great attention in Europe.

He was led to Costa Rica by the favourable reports he had heard of the mining districts there; and we may observe that even now they have great reputation on the coast. He repaired to the country, it seems, soon after his departure from Peru, and was so greatly impressed with the value of the mines, and their importance, that he made an extensive contract for various properties, and took up his residence there.

The district he was chiefly interested in lay next to the river and lake of Nicaragua, and south of it, being in another proposed transit route to Grey Town, as it is now called, or San Juan de Nicaragua, up the Serapique feeder of the Nicaragua River, and thence by valleys on the other watershed into the Gulf of Nicoya. On this table land, or central ridge, are seated Trevithick's mines. The mining district includes the mountain of Aguacate, nearly equi-distant between Punta d'Arenas, the port, and the Gulf of Nicoya; and San José in the inland, the capital of the state of Costa Rica, about 52 miles from the former and 36 from the latter, with a fair Spanish road passing between the two places, through the centre of the district. The climate of the table, or highland, is said to be good, which is very likely, as much of it is 7000 or 8000 feet high, and part of it is a good cattle-feeding ground, and in the lower grounds all kinds of vegetable, grain, and tropical produce are raised. The population, chiefly Indians, was at that time considerable.

The mining ground, Trevithick states, consists of a long ridge in a place called Quebrada Honda, or the Deep Glen, which admits of being easily drained by adits at the depth of 300 or 400 yards respectively. This ridge is full of veins of promising appearance, rich in gold and silver, and which were only discovered in 1821 or 1822, shortly before Trevithick went there. The mountain is described as well wooded, and what is to be expected at such an elevation, with a fall of water of great power, which happens to be a few yards from the veins, and running parallel to them for a considerable length. The fall is as much as 900 ft. in two miles, with enough water in the dry season to drive the stamping-mills. This was a sight to catch the eye of a Cornishman. The main formation he readily recognised being elvan, or porphyry, with veins running in straight uninterrupted lines, and in various stages of decomposition, both veinstuff readily to be broken, and with little gunpowder. When Trevithick went there the Spanish miners worked with the usual instrument—the crowbar. The surface produce was chiefly gold, with indications of silver, and increasing as the works were carried beneath the water level, at 15 ft. below which, being the greatest depth Trevithick had reached, ore having been found of upwards of 180 ozs. of gold and silver to the ton. Some of the ore was found bunchy and rich, but Trevithick depended on the lower produce steady veins, which likewise were to be got at from the surface, as much of the stuff would yield 2 ozs. of gold to the ton, which was reduced by the Mexican process, being stamping combined with simple amalgamation, which was prompt and inexpensive. Trevithick, however, chiefly depended on the silver workings, which he thought would yield more largely and more regularly, without the great fluctuations of gold produce. The first gold mines in the district were opened at Coralillo in 1821 or 1822, the discoveries being made by labouring men or Indians, who had not the means of doing more than opening the ground, and many of whom sold their rights for $10, $20, or $30. The first mine worked to any extent was Castro's Mine, which was quarried from the surface, and which in six years was supposed to have yielded about 40,000*l.* worth of gold, at the rate of 2 ozs. to the ton. The ores were reduced by arrastres, driven by men or boys, the ores too poor for the rude mode of amalgamation being thrown away. Quebrada Honda, where Trevithick worked, was found more productive in silver, though the gold ores were more carefully treated. In 1823, the existence of silver in the district was ascertained, and it was thenceforth regularly worked, being found as a distinct ore below the water level, and above it alloyed with the gold. The gold was first found in Coralillo, and this led to searches in the opposite ridge of Quebrada Honda; and so, again, the discovery of silver in the latter lead to searches for silver in Coralillo. One mine in the Quebrada Honda district most zealously worked was that of Padre Aria, an ecclesiastic. This mine was situated on the verge of the stream, and was first worked only for gold, but finding indications of silver, which increased progressively in sinking, they went down, but though they came upon richer ground the rush of water was beyond their means of drainage.

At Quebrada Honda, Trevithick secured a claim of 1800 yards, or about a mile long, including several individual mines, all held direct, except one mine, in which there were native partners, or rather it was held on a tribute of one-fifth to the former owners. In this enterprise Trevithick was assisted by Mr. John Gerard. They likewise secured some property in the gold district of Machuca. Up to the time of Trevithick's return no silver had been found in Machuca. The parties likewise secured the greater length of the water rights in the stream through Quebrada Honda. On the continuation of this stream 14 stamping-mills had been set up.

So far as we have learnt, Trevithick did not pay much attention to the working of Quebrada Honda. He must have landed in the country with very narrow resources, and had to maintain himself for four years. His time was chiefly spent in explorations, and acquiring mines, particularly in consolidating the claim at Quebrada Honda. It is to be presumed Mr. Gerard found the chief funds. Trevithick, it will be observed, landed from the Pacific side, and at that time there was no practicable and convenient communication from Quebrada Honda to the Atlantic side. He saw that to induce European capitalists to assist him in his enterprise he must establish direct communication, as the proposition even to ship the first materials and supplies by way of Cape Horn would be sure to be received unfavourably.

There were many inducements to open the Atlantic communication. St. Juan, now called Grey Town, was known to be a practicable harbour, and the mouth of tthe Nicaragua River, and a considerable part of the Serapique River, were navigable, but between Quebrada Honda, and on the other coast high ridges of some 7000 feet elevation had to be crossed, which, though they had been passed by foot travellers, had not been tried with the mule; and it was known there were difficulties in the way. Of course, it was necessary to have a road on which beasts of burthen could carry up the machinery for improved stamping and drainage. Trevithick and Mr. Gerard spent some time in these enquiries, but did not fully succeed, when they had left, in passing a mule over to the Atlantic side,

and although they saw enough to be satisfied of the practicability of the route, which has since been ascertained.

Having, as they thought, made sure of a basis for their operations, Trevithick and his associate set out for England, and arrived at Falmouth on Oct. 9, 1827; bringing back, according to some accounts, a pair of silver spurs, as the sole tangible remains of his great wealth. About that time Robert Stephenson, a young man, who was to be one of the restorers of the locomotive, departed for South America to survey the mines, which have now descended to the Mariquita Company; and the star of George Stephenson was about to rise as that of Trevithick to be eclipsed. He now set to work with Mr. Gerard to form a company to work Quebrada Honda, but the times were very unfavourable. In the ten years of Trevithick's absence many of his friends had died—for a large portion of active life is to be measured by ten years; many of his contemporaries had got too old to engage in speculations. Such was the case with Davies Gilbert, and some of his Cornish friends; and there were other staunch friends who were involved in the ruin of 1825 and 1826; and those who were disposed to help had had enough of South American mines and South American loans. To the active men of thirty and forty, Trevithick was unknown, and the home engineers of reputation were the men of name. Thus, although he estimated that 21,744*l.* would furnish all the required plant, and neither Mr. Gerard nor himself asked more than a share, he could not obtain the necessary capital. He provided for a tramway of six miles, with his usual sagacity, for 300 tram-wagons, or carts; for a water-course of 5500 yards; for 200 pairs of stamping mills, of four heads each pair, driven by 100 water-wheels, the heads being of 300 lbs. each, and for a high-pressure engine and pump gear.

Thus this hope fell to the ground, and in Sept. 1828, we find Trevithick busy with his old customers, the Corporation of London, about a proposal for whipping, or discharging, the colliers by steam, which he proved, but did not succeed in getting adopted, but which is now largely applied.

The Mines of Quebrada Honda have remained since Trevithick's time in about the same state. Costa Rica is still a promising country, but undeveloped. Intestine war, war with the neighbouring states, and the filibusteer war, have consumed its resources; but the day must soon come when it will be far otherwise, and when Anglo-Saxon enterprise from Grey Town, following the route of the Serapique, will apply the instruments of skilled mining to work regions of undoubted wealth.

OUTLINES OF PRACTICAL SCIENCE,

ESPECIALLY OF GEOLOGY AND MINERALOGY APPLIED TO MINING, CIVIL ENGINEERING, ARCHITECTURE, &c.—NO. IV.

THE UNSTRATIFIED OR IGNEOUS ROCKS, &c.

The unstratified and non-fossiliferous rocks, or the igneous rocks, as they are generally called, are not included in the table, because, as before observed, no fixed order of superposition can be observed in them. Perhaps gneiss most commonly lies above granite, but scarcely anything more can be affirmed on their superposition. They have not been well classified, and we can only here describe them generally; they may be ranged in five classes:

1. GRANITIC ROCKS.—Those composed of a granular mixture of quartz, felspar, and mica, with occasionally the addition of schorl and some other minerals. As the aspect of these rocks varies considerably, according to original chemical composition, or the mode of cooling, they assume a great variety of appearances (for which different causes have been assigned), so that in order to know what the variety really is, a mineralogical detail and a statement of chemical composition must be added to each rock bearing the general term *granitic*.

2. FELSPATHIC ROCKS.—The separation of these from the granitic is often somewhat imaginary or capricious, as indeed is the case with the great bulk of the igneous rocks, which sometimes pass into each other by obscure gradations, and without showing much of each gradation. The variety known as compact felspar is most frequently a compound of the elements of some felspar with a portion of silicic acid, beyond that required for the silicates of that mineral, so that when opportunities have occurred for crystallisation of the parts the result has been a compound of felspar and quartz, named *pegmatite*. The *trachytes* of active volcanoes, and those considered extinct, may represent the more pure felspathic rocks. Felspathic matter may constitute the great bulk of rocks of that kind and origin.

3. HORNBLENDIC.—These, including among them the rock in which the mineral *augite* in substituted for hornblende, compose a natural division, so far as the formations of these minerals may be sufficient to give a character to the mass of an igneous rock. In this division are included the dolerites and basalts of active and extinct volcanos; also the greenstones, generally of more ancient date. This term, therefore, comprehends the *volcanic rocks*, as they are commonly classed. Rocks of the above kinds are very extensively developed.

4. SERPENTINOUS ROCKS.—These also, to a certain extent, appear to be a natural group of igneous products, especially when regarded with reference to a peculiar aspect, and to the presence of silicate of magnesia (constituting the bulk of the rock) and combined water. Yet the rocks of this division vary somewhat materially in their constituent substances, and in the proportions of them. In all these rocks, whatever their variations, magnesia is a marked ingredient. To them belong *bronzite*, *diallage*, and *diallage rock* (*gabbro*). Some of the largest tracts of serpentine in Europe are in the Alps.

5. PORPHYRITIC ROCKS.—Granites, syenites (felspar, quartz, and hornblende), and other massive rocks, frequently exhibit a porphyritic structure by the development of separated crystals disseminated throughout the mass of the matter of which they are composed. Even serpentines become, in a manner, porphyritic where crystals of *bronzite* or *diallage* are dispersed through a base of that rock. The apparent conditions are that the chemical composition, and the mode of cooling of the general mass, are such that certain constituent substances can combine, and form separate and definite crystallised bodies, the remainder of the rock either not attaining this state, or only attaining it after the production of the first-formed minerals, and then confusedly. Various kinds of mineral matter which have once been in a molten state may be pophyritic—that is, hold some minerals or minerals crystallised, out and apart from the mass of the remainder of the rock. Crystals, such as those of felspar, are not uncommonly dispersed through a base of compact mineral matter, and when this latter is chiefly felspathic the rock is usually styled *felspar porphyry*. Crystals of other minerals, as quartz, are in like manner dispersed through a similar base. *Greenstone porphyry* consists of a granular base, such as a compound of felspar and hornblende, constituting greenstone, with dispersed crystals of felspar or hornblende. In like manner certain granites become porphyritic, and are called *porphyritic granites*, when separate crystals of felspar, confusedly crystallised, are scattered among the general compound.

Instead of classifying rocks according to their varieties of form and superposition into stratified and unstratified, schistose and compact, or normal and abnormal (as the different systems do), Humboldt would arrange all rocks according to their *order of origin*, which are from—

1. *Rocks of Eruption*, which have issued from the interior of the earth either in a state of fusion from volcanic action, or in a more or less soft, viscous condition from the action of fire or heat.

2. *Sedimentary Rocks*, which have been precipitated and deposited on the earth's surface, from a fluid in which the most minute particles were either dissolved or held in suspension. These constitute the greater part of what are otherwise named the secondary and tertiary groups.

3. *Transformed or Metamorphic Rocks*, in which the internal texture and the modes of stratification have been changed, either by contact with a rock of eruption (plutonic or volcanic), or by a gaseous sublimation of substances accompanying certain eruptive masses. *Metamorphism*, strictly defined, indicates the changes produced by agencies seated in the interior of the earth, often the effect of temperature or electro-chemical actions.

4. *Conglomerates*, coarse or finely granular sandstones, or aggregates of mechanically divided masses of the three previous kinds. Our *practical* objects will not permit of our entering further into these points, though the theoretic interest of metamorphism is very great, and its use in explaining certain phenomena considerable. It is, for instance, demonstrable in some countries than fossiliferous formations, some being of the age of the Silurian strata (as near Christiania, in Norway), and others belonging to the oolitic period (as around Carrara, in Italy,) have been *metamorphosed*, or transformed partially into gneiss, mica schist, and statuary marble.

The cause of the metamorphose has apparently been the influence of subterranean heat, acting under great pressure, or possibly chemical and electrical action operating in a manner not yet well understood. Such causes we term *Plutonic* (from Pluto, the mythological king of the infernal regions), as comprehending in one word all the modifying causes which may be acting at great depths, and under conditions never exhibited at the surface of the earth. To such causes—to Plutonic action—the fusion of granite itself must be attributed, as well as the production of a metamorphic texture in sedimentary strata. The age or primary condition of each metamorphic formation may be twofold—1. The period when it originated as an aqueous deposit, in the form of mud, sand, marl, or limestone; and, 2. The period at which it acquired a crystalline texture. From these two points of view, the same strata may be very ancient in reference to the time of their deposition, and very modern in regard to the period of their assuming the metamorphic character.

Large tracts, therefore, of primitive rocks, as they are commonly termed, may have been originally deposited as the sediments of seas, and subsequently altered by subterraneous heat or other causes. They resemble the sedimentary rocks in displaying marks of stratification, and many of the upper slaty beds of the system pass into overlying slaty deposits, which are unquestionably of aqueous origin. On the other hand, they are allied to the system below them by the circumstance of their possessing no organic remains, though they may have once possessed them, and the traces of them may have been obliterated. They are also more intimately blended with the Plutonic rocks by their often graduating into the granite of the underlying Plutonic system.

Although these igneous and non-fossiliferous rocks do not so largely contribute to practical uses in the arts and trades, considered as building stones, &c., as the secondary and tertiary rocks, yet they are of vast importance as constituting the larger features of scenery and mountain ranges. It is also remarkable how closely they sometimes approach to secondary rocks in the same ranges of mountain, on opposite sides. Thus, M. De Saussure notices the striking difference of the prevailing formations on the two sides of the Alps. On the north, limestone or dolomite (magnesian limestone) predominates, and consecutive ranges of calcareous mountains extend along a great portion of it. By reference to the convenient reduction of MM. Studer and Escher's geological map (a very useful companion to the Alpine traveller), it will be seen that there is a distinctly marked belt of secondary ranges of these formations, allied to the Jura limestone, running along the north side of the lofty chain of the central Alps, which (as of Mont Blanc, Monte Rosa, or the higher peaks of the Oberland) are composed chiefly of granitic or schistose rocks.

On the south side, however, the calcareous formations constitute a comparatively insignificant proportion of the geological system, and are merely occasional patches. The predominant components of the ranges of the Italian valleys are granites, micaceous and chlorite schists, quartz, gneiss, and almost every variety of metamorphic rock, together with some of the largest tracts of serpentine in Europe, and masses of hornblende, *gabbro*, and syenite. These impart to the scenery that "remarkably abrupt and romantic character which entirely distinguishes it from the Swiss Alps, and occasions that bold rugged form and peculiar richness of rock-colouring which fascinate the eye of the artist as much as they surpass all the efforts of his pencil."—(King's *Italian Valleys of the Alps.*)

A PRACTICAL GEOLOGIST.

THE MINING AND SMELTING INTERESTS OF CHILE.

VALPARAISO, DEC. 15.—The effects of the fire are still severely felt, and business much interfered with. The steamer from England is again delayed a day over time; this arises from a better condition of affairs in South America. The quieter state of Peru is beginning to give a little more confidence to trade in that country, and the consequence of this gradual restoration of trust is the resumption of business along the coast, so that the mail steamers take much more cargo from Lima and Callao for the Peruvian ports than a while ago; and hence they have got delayed for several fortnights past.

Whether the quarrel between Ecuador and Peru will counteract this I do not know, nor have I heard what has been done in the blockade of Guayaquil, established by the Peruvian Government. Our merchants hope the English Government will support the Ecuadorians in the quarrel, and protect the interests of the English bondholders, whose acquisition of the waste lands on the Amazon Rivers has caused this dispute. Looking, however, to general policy, it is impossible for England to interfere primarily in the South American question. Our American brethren reject the application of European nations in America, and claim the lead in intervention. True it is that there is a personal fear of the Americans on the part of the South Americans of annexation; but although this gives rise to hostile feelings, yet the Americans always have the support and sympathy of one of the many factions in each country, and are thereby powerful. For the English to take a primary part is, therefore, to censure the hostility of the Americans, and of their local adherents, without acquiring the real sympathy and gratitude of any one. Such has been the result of our interference from time to time in this country. This is not all the evil, for wherever we intervene, the French, who are always intriguing for power, do the same; and as we have the benefit of the *entente cordiale*, the allied French naval commander and envoy co-operate on the same footing with the English, embarrass our proceedings, diminish our power, and get up a power of their own. The ill effects of this in the Plate provinces can be well enough seen.

Thus England is every way the sufferer; while hampered by a French alliance she represents European despotism in the eyes of the Republicans, while the United States represent the principles of liberty. The only effectual way, therefore, is to do in South America what we are doing in Central America—concert our policy with the United States, with which we have common interests for the advancement of commerce, civilisation, and the supremacy of the Anglo-Saxon race. With the United States we can achieve success; against them we provoke their hostility, and gain nothing.

Reverting to the interests of the bondholders in Ecuador, I must observe that a footing once made good at that point will lead, if properly followed up, to most important commercial and territorial advantages. The South American Spaniards are for the most part like dogs in the manger—they cannot devote themselves to the due development of the inexhaustible resources which the splendid countries they hold possess, and hence the rage with which Peru has seen this step of the Ecuadorian Government. On the coast of Ecuador they are looking anxiously for the promised occupation of Pailon by the company of Ecuadorian bondholders, formed in London. The resources of Pailon are great, and if German colonists are introduced, as they have been in this country at Llanquihue and elsewhere, they will do well.

The price of quicksilver is beginning to affect our silver interests, and those along the coast. As a measure for giving relief in Peru, the Congress has voted supplies to purchase 6000 quintals, or 6,000,000 lbs., of quicksilver yearly. We have heard the unfavourable news that the Federal Government of the United States has put in a claim to the Almaden Mines, in California, which were sending considerable supplies to the American markets. The nitrate trade at Iquique is now brisk, the price at Valparaiso is $2 37½ c.

Mr. Astaburuaga, lately envoy from Chile to the States of Central America, has written a very interesting book on the resources of those countries. It is said a translation will be published in England.

Political matters are quieter here, but the spirit of faction is not extinct.

The mining interest is extremely downcast at this year's results, which successive falls of copper make more and more sensible; but many merchants, considering these prices cannot last, readily speculate at these low prices, although they must have lost on shipments already made.

Measures are already taken to restore the burned part of our city, and, if possible, on a finer scale. Mr. Lloyd, C.E., has been called in, and has laid down a plan of a street, which will be a great improvement to the city if carried out. We have had two fires since, one at the railway station.

The nominal quotation of bar copper is $17 to $17 25 c.; 25 per cent. shipping ores, 19 reals; regulus, 50 per cent. to 60 per cent., $7 25 c.; fire-bricks, $50 to $55 per 1000; gunpowder for blasting, $15 to $16 per quintal.

Through the short supply of English, there is a good trade in Chile coals. Lota are selling at $5 on the spot, and Coronel $4 50 c. Since the *Riddam* from Swansea, on Nov. 21, no English ship has arrived with coals, but the Hamburgh barque *Gundela* came in on Dec. 5.

The provincial Government of Coquimbo are making a road from Serena to Elqui in extension of the railway, the beginning of which is early expected. The engineer of the road is M. Jacquiere, a Frenchman.

Most of the railway documents were burnt in the late fire at Valparaiso, together with other papers and property in the late Mr. Caldcleugh's house, but fortunately the precaution had been taken of sending to England the necessary duplicate documents.

The smelting business in Coquimbo is in a bad state. It is understood Mr. Edwards will slacken his smelting until better times, so soon as he has reduced his stocks. All the smelters want coal just now; there have been a few sales at $15 per ton for English on board, and for Chilian at $8 on board. The Guayacan Works were very short, but the manager luckily bought up 800 tons. The Herradura Works are stopped, so are those at Tongoy, Tortoralillo, and those lately belonging to Messrs. Tagle and Tenham. Ores are nominally at 5 reals for 10 per cent. carbonates, but no quantities can be got, as the best mines are under advances, and the poor mines cannot work at such rates. The smelters must either support the mines by giving better prices or suspend their operations. It is said the Coquimbo smelters are combining to average prices, and put a stop to the late competition, but they are like a rope of sand. Mr. Lambert is altogether independent of any such combination, and has his own sources of supply; he, therefore, smelts or ships his ores as suits his convenience. Sulphurets are as usual high. Mr. Lafburcade has got 10¼ reals for his, and the fine jote ores have been sold to Mr. Powditch, the enterprising manager of the Copiapo Company, to be shipped to Caldera; they will stand the same price delivered at the Copiapo Smelting Works. A new ore agency has been opened at Tongoy.

The *Owen Glendower* arrived at Port Coquimbo, on Nov. 22, with coals, from Swansea.

Daniel John, head mason of the Herradura Works, was found shot through the head in his room at Herradura. The English Consul had been called in to investigate the circumstances, and take charge of his effects. The funeral took place in the Protestant burial ground, and was attended by many of the Welsh from the neighbouring works. Another smelter has been sent home on account of insanity, and his wife and children have been left behind, in much distress for want of means to carry them home.

Great expectations are entertained by the miners as to the smelting works at Herradura, lately belonging the Mexican Company, of London. A gentleman has arrived from Valparaiso, on the part of the purchasers, to assist in the stock-taking. The works are reported to be in excellent condition, and to be capable of doing a large amount of business in copper and silver, when the copper market is in a more favourable condition. There is, however, no present appearance of the works going on, as the staff are all discharged.

From Copiapo the news is most satisfactory. After years of depression of the silver interests, we have received a shipment of silver such as has not for a long while been seen. Confident hopes are entertained that the long-expected third *manto* has been reached, and another source of great prosperity been obtained. It is the opinion of the highest authorities, local and foreign, who have examined the district, that this manto does exist. Such, among others, have been the opinions of Mr. W. J. Henwood, F.R.S., and Mr. D. Forbes, F.R.S., who have within the last twelve months examined the Charnarcillo and other silver districts.

The mining and other property of Don Nicolas Vega, at Copiapo, which has been long on the market, has, it is understood, been sold, but at a very reduced price, as it is the wish of the family to reside in Europe.

At Caldera smelting is slack, except at the Copiapo Smelting Company's Works, which the activity of Mr. Thomas, the manager, keeps extending. Mr. W. Rodbard, late of the old Caldera Works, has been engaged by the Copiapo Company.

The following are the exports of minerals for the first six months, which I have reduced to English equivalents, so far as it can be conveniently done. The copper ores may be considered as 20 per cent., the regulus as 55 per cent., and the copper at 97 per cent:—

	Copper Ores.	Copper Regulus.	Bar Copper.
January ....Tons	2,500	560	200
February	5,000	300	—
March	1,200	990	45
April	3,900	300	—
May	1,800	500	—
June	2,400	700	—
Total	16,800	3350	245

The total of copper is, therefore—

Ores ....Tons gross	16,800	Tons copper 3,360
Regulus	3,350	1,840
Bar	245	245
Total tons copper		5,445

The silver ores exported were—Jan., 320 tons; Feb., 26 tons; March, 260 tons; April, 700 tons; May, —; June, 150 tons = 1460 tons. The silver contents are not stated. Thirty tons of copper and silver ores were shipped in April. Of argentiferous copper regulus, 40 tons were shipped during June.

The shipments of bar silver were:—Jan., 8256 lbs.; Feb., 6515 lbs.; March, 9460; April, 9458; May, 5745; June, 5721.=45,157 lbs. The quantity of gold exported was only 115 lbs. The value of the shipments was between 400,000*l.* and 500,000*l.*

The shipments from Copiapo in the last fortnight are reported:—

Nov. 16. *Santiago*, 320 tons of copper ores to England.

Nov. 18. *Georgiana Grenfell*, 280 tons of copper ores, 315 tons of copper regulus, and 30 tons of argentiferous copper regulus, to England.

Nov. 18. Mail steamer *New Granada*, 2699 lbs. of bar silver to England.

Nov. 19. *Castelerides*, 450 tons of copper ores to England.

Nov. 26. *Atahualpa*, 245 tons of copper ores, 50 tons of bar copper, and 390 tons of copper regulus, to England.

The *Pickwick*, *Quillota*, and *Sunbeam* are loading, the latter for the American market.

There is important news from the South, which I did not mention before. It is stated that in the Quebrada de Lledepe, a few miles from where the large German colony is established at Llanquihue, a discovery has been made of silver mines. Some stones were discovered so rich that they were worked up at a smith's forge, and are said to be half silver. It is well known there are large mineral resources in the South, but if this report be confirmed, it will be a great thing for the colony of Llanquihue, for the South, and for the country at large. One advantage of Llanquihue is that European skilled labour will be available.

Although there are still many causes of depression, on the whole business looks much better than for a long while past, and the prospects of Chile are good. The railway returns are flattering.

ON THE PROGRESSIVE APPLICATIONS OF MACHINERY TO MINING PURPOSES.—At the Institution of Mechanical Engineers, Birmingham, Mr. T. J. Taylor, Earsdon, Newcastle-on-Tyne, read a paper giving an account of the several processes and mechanical appliances employed in the Newcastle coal field from the earliest times, with the various improvements gradually effected, and the progressive applications of machinery introduced into the different branches of coal mining in that district. In the earlier periods the coal was worked only when lying within such a depth below the surface of the ground as allowed of natural drainage by an open adit, along which both water and coals were brought; no special provision for ventilation of the pits was then required, and none but the rudest contrivances for bringing the coals to the surface. As the depth of the pits increased mechanical appliances became necessary for these purposes, and power was obtained by water-wheels or horses employed in working windlasses for raising the coals and bucket, or chain pumps for draining the pit. Subsequently the introduction and gradual improvement of the steam-engine and its employment for the drainage of mines allowed a great extension of mining; but it was not until within a comparatively recent period that the steam-engine was applied directly to winding the coals to the surface, having been used previously to pump water from the mine for driving a water-wheel to raise the coal—an ingenious plan of double water-wheel, with buckets set in opposite directions, being employed in reversing the motion in winding. The quantity of water raised from some of the mines in that district is very great, and becomes the most important consideration as to the power required, in consequence of the average weight of water to be raised exceeding that of the coal, being in some cases eight tons of water to one ton of coal, and in one instance nearly thirty times as much water as coal. A simpler construction of direct-acting engine was described as being introduced in place of the large beam engines. With regard to ventilation of mines the furnace system has continued almost unaltered to the present day in the northern coal field, the current of air through the mine being produced by the rarefaction of the air in the upcast shaft by means of a furnace at the bottom of the shaft. This system of ventilation is universally used in the mines of that district; and although several plans of ventilation by mechanical appliances have been invented, the preference is still given to the furnace, on account of the certainty and simplicity of its action and the quantity of air supplied being much greater than hitherto obtained by mechanical means. At the same time its disadvantages are felt, such as the injury caused by the corrosion of iron tubbing in the shafts; and the application of the fuel is theoretically inferior

in economy, though this is a point of less moment there than in any other districts, in consequence of the coals having to be prepared for market by screening, to separate the small coal, which would be of little use if not burnt under the engine boilers and in the ventilating furnaces. The points to be kept in view in attempting the substitution of mechanical means for furnace ventilation are, that the same quantity of air should be supplied, that the supply should be equally constant and certain, and attended with greater economy. The progress and gradual development of railways in the colliery districts was referred to; and the great need at the present time of improvements in the underground arrangements for conveyance of the coal was urged, the cost of conveyance underground being three or four times that above ground; and a notice was given of the rapid advances in coal mining already realised by the development and extended application of the powers of the steam-engine. The paper was illustrated by an extensive and interesting series of diagrams.

CORNISH MINE PHOTOGRPAHS—SECOND SERIES—No. XI.

"ROSEWALL HILL."

"Fish, Tin, and Copper," is a phrase that has been a standing toast in Cornwall for centuries, and is as duly used at feasts of all classes of persons and professions as any of the loyal or patriotic toasts of the day. When it was first adopted is unknown, but the arrangement of the words would imply it was at a period anterior to the produce of copper superseding that of tin. The pilchard, mackarel, and other fisheries, along the extensive seaboard of Cornwall, have long ministered to the necessities of mankind, and, with the tin streams, were probably the chief reason of Cornwall being comparatively densely inhabited at the early period we find recorded in ancient history. The true position of the relative interests have, however, greatly changed; indeed, quite reversed. Probably from no eminence in the county could we more appropriately study or illustrate the ancient and lasting staple produce of this richly-endowed county; in doing so, we shall follow the modern system, and place the interests in their true position, as "Copper, Tin, and Fish."

The Rosewall Hill is a granite boss of considerable elevation, from which a fine view of St. Ives Bay, and all the neighbouring mines, may be obtained. It is surrounded on three sides by trap rocks and compact argillaceous slates, which have yielded, are yielding, and probably will for many generations continue to yield, vast quantities of copper and tin ores. It is the junction of rocks to which this peculiar fecundity of mineral is usually ascribed. Within a radius of two miles are some of our most productive mines, the lodes of which have been proved to produce alternately tin and copper ores, and not unfrequently so intimately and equally blended as to render it a matter of difficulty to pronounce for which metal the stone is the more valuable. In this particular they coincide with other celebrated mines, whose geological features are synonymous—as at the Botallack and Levant Mines in St. Just; Dolcoath, Cook's Kitchen, and Carn Brea, near Redruth. We have in some of our previous papers said copper ore was [illegible] wrought for in Cornwall at one of the latter mines; we find, on enquiry, that we were right.

The extensive mine at the foot of the Rosewall Hill, although worked as a tin mine, has frequently made considerable sales of copper ore. It is called the St. Ives Consols; is a very extensive and celebrated mine, having returned vast quantities of tin, and paid the fortunate proprietors hundreds of thousands of pounds profit. In this mine was discovered the largest carbona, or floor of tin, ever found. On describing the Providence Mines, in one of our previous papers, we published an engraving, and detailed description of these phenemona, for they may justly be called so, being peculiar to this locality. To those who may not have seen our paper, we beg to describe them as being huge excrescences from the sides or walls of the lodes, having no particular shape or outline; the lodes in which they are usually found contain hollow places, called "vughs" by the miners: a good carbona is usually a great fortune. This mine, in its most palmy days, was under the management of the late Capt. Tredinnick, father of the present Mr. R. Tredinnick, of Austinfriars, and in this very mine did this gentleman practically lay the foundation of the mining knowledge that has served him in such good stead. We digress, we are aware, but incidents and facts like these should not be overlooked or forgotten. The mine between the St. Ives Consols and the position we occupy is the old Ramsom and Rosewall United Mines. These have been wrought to a great extent by various companies, and at good profits; the rich tin ground trending away west from the St. Ives Consols promises a rich harvest to the present adventurers; who, from the energy displayed, and capital invested, certainly deserve success of the first degree. On the north-east, to the left of St. Ives town, is the Carrack Dews Mine. This is in a hard killas rock, produces little tin, but holds out high promise for copper ores: here may be procured the curious and beautiful varieties termed *horse-flesh* and *bell-metal* ores. The mine due east of St. Ives Consols is the Wheal Trenwith, once exceedingly rich for tin and copper produce, the latter preponderating—fortunes were realised, and the mine abandoned. A few years since it was set to work by a party, who literally carried out the old nursery distich—

The King of France, with twenty thousand men,
Went up a hill—what then? Came down again.

This they certainly did—they set the mine to work with a powerful steam-engine and effective plant, pumped out the water, and abandoned the mine without sinking it a foot, or giving it a trial: the mine at the former working gave a profit of 40,000*l.*: the mine is in killas. To the south-east of this, and near the cliff, is the Wheal Margery, which produces both tin and copper, but is usually reckoned a copper mine. This property is regarded as an excellent investment, the returns gradually increasing in quantity and quality as the mine gets deeper; it has not hitherto paid dividends, but will probably do so during the current year. This mine is near the junction of the granite and killas.

Turning further south we perceive, near the monument of the late Mr. Knell, on the top of a hill, the Trelyon Consols Tin Mine. This mine has returned considerable amounts of rich quality tin, and has paid good dividends. The mine is not deep, and is entirely in the granite formation.

Further south is the Providence Mine, which has been worked for many years; the lode may be seen in the cliff, and copper ore broken therefrom. The mine has yielded large quantities of copper ores, but is now only worked for tin, of which it contains what may be at present termed an inexhaustible supply. The mine has returned about 100,000*l.* profit, and pays regular and handsome dividends. This mine is full of carbonas, none of which occur above the 60 fm. level: the copper ore was procured in the clay-slate, and the tin is in granite.

Immediately adjoining is the East Providence Mine, lately set to work under the most promising auspices, and by a powerful company of capitalists; recent reports hold out high promises of success, which we trust will be verified. The Providence Company have worked their mine nearly to the boundary of the two setts; and the East Providence party entertain [illegible] hopes of the riches of the parent mine being continued into their property. On the south and south-west are the rich tin mines, Wheal Margeret, Wheal Kitty, the celebrated old Wheal Reeth, from all of which immense dividends have been derived. On the west of the latter mine are the Reeth Consolidated Mines, from which more than 200,000*l.* worth of tin has been sold during the last twenty years.

Looking away west as far as the eye can reach, traces of old works and streams are visible; no record exists of their being wrought; but as all this part of the country is "bounded" (a right of possession to certain portions of the produce, peculiar to Cornwall), it is pretty certain these lands have anciently been extensively searched. Between the Rosewall Hill and Wheal Reeth is the Balnoon Mine, once in high favour, but now abandoned. The newly-erected engine-house and works on the north-western declivity of the hill, are of the Brea Mine, now attracting considerable attention, as discoveries of importance are reported. This mine is, like the Providence Mine, St. Ives Consols, &c., at the junction of the granite and killas, are said to contain both tin and copper lodes. The mine at present is in high favour; and certainly, if position amongst mines, or peculiar strata, be any recommendation, this property contains the elements of prosperity that can hardly fail. So much for the copper and tin part of our subject.

We need not indicate which way to look for the beautiful bay of St. Ives, with its silvery sands and bluff black cliffs; from our heights they are laid out as a map at our feet, forming part of as exquisite a panorama as can be seen in any part of the county. Far off, on the east, on a fine day, may be seen the entrance to Padstow Harbour, nearer, those to the port of Newquay and Portreath; almost at your feet the Bar of Hayle; these form the northern ports, whence Cornwall's produce is shipped to Wales, and to which coals are imported therefrom.

This celebrated bay is the principal seat of the great Cornish pilchard fishery: the quantities taken in some years surpass belief, in others scarcely a single fish is secured: the fishery is quite as great, if not a greater, speculation than mining. That spirit of adventure, so leading a characteristic of the Cornish people, however, supports this interest with amazing zeal. Though the "schools" (shoals) of fish pass through the bay but rarely in a season, yet so eager are the inhabitants to have a part of the prize, that notwithstanding only about six or eight boats can fish at one time, and each of these within its prescribed limits, as if the fish go from one "stem," as the distance so prescribed is termed, they cannot be followed by others, each must wait its turn; thus only a few hours can be allotted to every boat. An Act of Parliament was obtained for the due prosecution of the fisheries, by which these limits became defined and legalised, yet not less than 150 "seines," the name of the net in which the fish are enclosed, are engaged to secure the finny prey. When taken they are prepared in a peculiar and coarse manner, packed in casks called hogsheads, containing several thousand fish each, and are then sent to the Levant, and many ports of the Mediterranean, where they are highly prized. The oil expressed from these fish is valuable to the currier, and is much in demand. The quantity taken at St. Ives during 1858 amounted to 12,000 hogsheads, of the value of about 3*l.* per hogshead, irrespective of the price of the oil, which is usually calculated to pay the cost of curing the fish. The aggregate of the other Cornish fishing stations may be said to be about equal to the preceding. Thus, it must be admitted, Cornwall derives no inconsiderable revenue from this one species of fish. The mackarel fishery is of equal value; and the general coasting, or white fish, as that sort is called, may be considered as representing a similar amount. These fisheries have been practised from the earliest ages, and undoubtedly were once considered her principal staple commodity.

It is only by ascending such heights as we are supposed to be on that we can form a just appreciation of Cornwall's extent, or of the amazing sources of wealth developed by her industry. From this spot may be seen the places where thousands daily ply their toil beneath the soil or on the treacherous ocean, each in his sphere adding to the nation's wealth, and to domestic comfort and happiness. It is well worthy of a visit by the naturalist, the geologist, the political economist, or the general enquirer.

We think, by these premises, we have shown why the old toast was adopted in the manner expressed, and that we have given ample reason why it should be reversed, and "Copper, Tin, and Fish," be substituted.

GEORGE HENWOOD.

LEGITIMATE MINING.

The following extracts from Mr. Murchison's valuable works on Mines cannot be too much impressed upon those who are sincerely desirous of promoting legitimate mining:—

"I believe that if those interested in legitimate mining concerns were occasionally to visit the properties, accompanied by a competent practical person, they would arrive at much more correct conclusions as to their probable value, and the nature of the objects proposed to be arrived at; while it would increase their confidence in prosecuting the works. Many persons really know nothing of the merits of the operations carried on, and what it is intended to accomplish, and when success may reasonably be expected. If a mine does not at least pay its costs as soon as the machinery is erected, it is often at once condemned, and considered to be a worthless affair."

"How many of the mines now paying dividends, and others approaching a profitable state, have been abandoned by at least one company from want of perseverance and capital, before they fell into the hands of the present fortunate proprietors? By the time 5000*l.* or 6000*l.* have been expended by a company the adventurers generally begin to "grumble," and almost despair of success. They are apt to be guided by the apparent outlay of some of the most successful mining enterprises, forgetting the sums spent on these properties by former companies, and of which the existing undertakings have had all the benefit. They seem to think that mining is a pursuit for the success of which the most moderate expenditure ought to suffice, and that no mine which requires more than 5000*l.* or 6000*l.* can ever pay! It would appear to be thought necessary only to erect the machinery, and set to work sending the ore to market at once in remunerative quantities, while, as regards copper at least, the mines do not generally become permanently and profitably productive until an average depth of 50 or 60 fms. have been attained, and some of the most lastingly rich lodes have not yielded any ore until a good deal deeper, as at Phœnix Mine and others."—Second Edition of Book, pp. 12–14.

"It may not be amiss, nor out of place, to refer here to a few of the more remarkable cases of mines which have been abandoned, or were on the eve of being so, and which, by subsequent perseverance, and the spirited application of capital, have been brought into a prosperous and profitable state. It may surprise some of my readers, when I inform them that the Devon Great Consols (then Great Wheal Maria) was abandoned by a former company, who sunk within 3½ fms. of the great course of ore, which the present company reached by a trifling expenditure, and that the shares were actually offered at a few shillings. I need scarcely remark that this company has divided 414,000*l.* in the last ten years, and that the 1*l.* shares are worth 390*l.* At West Caradon Mine a crosscut was driven 150 fms. to intersect Jopp's lode, and when it was cut it was found to be less than 2 in. wide, without a spot of ore; it was driven on for 6 fms., and still no signs of ore, when it became a question with the shareholders whether they would lay out more money on this point. The manager strongly recommended them to persevere, they did so, and in 7 fms. more driving the lode became worth 150*l.* per fm. for copper, and from this place a stone of ore, weighing 32 cwts., appeared at the Great Exhibition of 1851. Wheal Buller was worked in conjunction with another piece of ground for a considerable period, and failing of success the shareholders abandoned it. It was then taken by others parties, and in a short time yielded profits, and is now the most profitable mine in Cornwall, the market value having lately been upwards of a quarter of a million sterling. West Basset was purchased, after the failure of a previous company, by the promoters of the present one for 736*l.* A sum of 12,000*l.* has already been divided (Review, 1855), and the shares are current at a price which represents nearly 200,000*l.* for the mine? a value which is based on immense reserves of ore, and a prospect of large and continuous profits. Hingston Down and South Tamar Mines were, a very few years since, in a condition which made it doubtful whether it was desirable to prosecute or abandon them. It was, however, resolved to continue them, and success attended the efforts. The shares in South Tamar which sold at 11s. 6d. per share are now, with 20s. 6d. paid up, selling at 7*l.* per share, besides having divided about 22,000*l.*, and paying regular dividends. The shares in Hingston Down, which could with difficulty be sold at 6s. and 8s. per share, are now, with 37s. 6d. paid up since, selling at 12*l.* per share, 5850*l.* having already been divided, and the mine is making a profit of 1000*l.* per month. Many other such cases might be adduced, but these are sufficient to show that there are failures in mining which are not caused by the merits of the speculation itself."—Second Edition of Book, pp. 18–21 (1855).

"There is scarcely a dividend mine that has not been abandoned at least once, from the want of spirit in the first instance to advance the requisite capital to carry it out. Some persons embark in a mine, and by the time about 6000*l.* has been expended, the greater part most likely in the necessary machinery and preliminary works, they are much disappointed if profits are not realised, although, with the greatest energy and expedition, only about 20 to 30 fms. from surface may have been reached. It may be that the lode promised, from its appearances at surface, to be unusually productive at a comparatively shallow depth, but if it should turn out not quite so rich near the surface as expected it is at once condemned, and abandoned as a failure. Other parties, with more correct and comprehensive views, then continue the operations, having the advantage of the work already done, and of course reap the success to which their spirit and perseverance entitle them. The history of nearly every one of the many successful mines shows it to have been worked by successive companies before it became profitable, proving the opinions of the advisers of the original proprietors to have been correct, although in some cases at the time of the abandonment they were, no doubt, regarded as nothing better than swindlers."—Third Edition of Book, pp. 210 to 211.

"It can scarcely be said that it is any recommendation to a mine that its shares are 'dealt in' in the market. There are many concerns which are not known in that 'locality' in which it is much more desirable to invest than in a good many of the former. Particular mines are often spoken unfavourably of by persons who know as much about them as they do about the inhabitants of the moon or the stars. The last few years supply some striking proofs that 'dealings' in the market are no criterion of the true merits and value of mines. One concern, in 12,000 shares, was 'worked up' to 7*l.* or 8*l.* per share, and after paying 10s. per share in dividends, the shares are now about 22s. 6d.; another, in 5000 shares, was 'run up' to 16*l.*, has paid no dividend, and is now about 4*l.*, or little more than the calls which have been made since; another, in 12,000 shares, was run up to 37s. 6d., and is since wound-up; another, in 4000 shares, was raised to 10*l.* or 11*l.* per share, has since paid a dividend of 5s., and is now under 3*l.*, and barely paying costs; and another, in 4000 shares, was 'got up' to 20*l.* per share, has made calls almost ever since, and during part of the time the shares were quite unsaleable at *any* price; the 'market' would not 'touch' them, and but for the praiseworthy perseverance and spirit of the *bona fide* shareholders the recent discoveries would not have been made, and the shares be now saleable at between 5*l.* and 6*l.*, with the prospect of becoming more valuable. These facts are mentioned merely to show that it must not be supposed that those mines must be best the shares in which meet with favour in what is chosen to be called the 'market.'

The experience of the writer induces him to strongly advise those who are interested in mines, or may be inclined to invest in them, not to be guided, generally speaking, by the so termed market prices. In a large majority of cases they will only prove deceptive. Let everyone look carefully into the merits of each concern he embarks in—let him visit the spot himself, with some trustworthy practical man sufficiently acquainted with the circumstances to give an impartial opinion—or let him send a competent and reliable person to report to him. This can always be done, and a few pounds expenses may save many pounds of loss, while it may also lead to very successful results, and well repay any trouble taken. No fortunes have ever been made yet by simply speculating in mine shares; it is the *legitimate and preserving miner* who has met with reward, of which there are many instances.

Those who find and provide capital for vigorously developing the value of lodes are the true promoters of British mining. In carrying out this object many difficulties are often met with. There is often opposition arising from prejudice and jealously, as well as ignorance, but if the representations made can be justified, energy and perseverance will overcome such unworthy obstacles. It takes time and money to thoroughly prove and lay open a mine; and during the time of erecting machinery, sinking shafts and winzes, driving levels, &c., there is little but honesty of purpose, and the opinions of respectable and experienced persons to support the course adopted."—Review, Sept. 1858, pp. 11–14.

"With reference to the observations of the writer, in his last Review, relative to what it termed the 'market,' and the promotion of legitimate mining, he would further urge that all those who are engaged in a *bona fide* way in this important branch of national industry should use their best exertions to purge it from those disgraceful practices which inflict so much damage on the general interest. It is surprising to see the effrontery with which some persons argue, and base their opinions upon misstatements influenced by personal feelings, and without the slightest regard to the circumstances which should guide one to correct conclusions. They allow their envy, jealousy, or personal dislike to individuals, to enter into their calculations, and in this manner publish statements at variance with facts, while others adopt the same course for equally unworthy objects.

Again, as the writer has before remarked, there are some who speak unfavourably of particular mines, who literally know nothing whatever about them, and who could not give the least explanation of their merits, of the objects in view, or the state the operations are in; yet they unhesitatingly pronounce them as 'rubbish,' and 'worthless,' when probably they are intrinsically of greater value than most, or any, of those which they are accustomed to 'deal in.' Such conduct is certainly not honest, and any step which the law may allow to check it should be adopted.

The persons whose vocations have been described are generally those who not only have been connected with no successful mine themselves, but do not know the *meaning* of 'legitimate' mining. They cannot understand how a mine can be carried on (in many cases requiring capital to do so) while the shares are not 'dealt in in the market.' Paying calls to sink the necessary shafts and winzes, and drive the levels and cross-cuts, is not part of their business. Everything is worthless which they cannot make money out of. They may be reminded, however, that some of the most *bona fide* and *promising* concerns are principally carried on by persons whose object is to *work the mines*, and not simply to speculate in the shares. How many instances might be given of the shares of rich mines having been at one period unsaleable, or only nominal. Even the shares of the Devon Great Consols are said to have been at one time 'hawked about!' But also every mine in the Dividend List might be given as an example. Again, take several of the progressive mines, at which important discoveries have lately been made. It is said that a year ago Bryntail shares were sold at 2s. 6d. per share, and they are now 11*l.* East Russels were, about two years ago, unsaleable at 1s., and they are now 7¼*l.* East Bassets, four years ago, were scarcely saleable at 20*l.* per 256th, not having then sold a ton of ore, after being at work for years, and the sinking of the shaft getting on slowly at 50*l.* per fm., without any immediate prospect of a discovery, while they are now 175*l.* per 512th (equal to 350*l.* per 256th). About eighteen months ago Cwm Erfins were nominally about 20s. (a few years ago a large holder also relinquished his shares), and they are now 14*l.*, and have begun to yield dividends.

Now, I would ask who are the promoters and supporters of mining? Those who carefully consider the merits and objects of the mines they are embarked in, and on competent and respectable practical advice carry them on vigorously, with a view to make them profitable undertakings? or those who simply look to what has been done, make no enquiry as to the prospects, pay no regard to the circumstances and the consequent probabilities of success, and who are simply guided (or profess to be so) by the price to be got for shares among those who have no interest, and are totally ignorant of their intrinsic value? This brings the writer to repeat the advice he gave in his last Review—namely, that every one should 'look carefully into the merits of each concern he embarks in—let him visit the spot himself, with some trustworthy practical man, sufficiently acquainted with the circumstances to give an impartial opinion, or let him send a competent and reliable person to report to him. This can always be done, and a few pounds expense may save many pounds of loss, while it may also lead to very successful results, and well repay any trouble taken. No fortunes have ever been made yet by simply speculating in mine shares; it is the *legitimate and persevering miner* who has met with reward, of which there are many instances.' If this plan is adopted, investors will probably find it greatly to their advantage, as they will, no doubt, be able to make judicious selections for themselves, at comparatively low prices, and to which it is not likely that in some quarters their attention would be directed.

The object of the writer, in his periodicals, is to give (as stated on the title page) a 'Review of the *progress* of British Mining, with particulars of the position and prospects of the principal dividend and progressive mines.' The first chapter always enters into the results and prospects of mining generally, and then a brief account is given of a number of the most important and promising mines; respecting which trustworthy information can be obtained. It is impossible to notice every mine, or go very fully into any, so that only those of a *bona fide* character, respectably and legitimately carried on, and possessing reasonable points of success, are selected. The writer is guided in his remarks by the advice of the most experienced, respectable, and eminent practical authorities in the several mining districts, with whom he is in constant correspondence, and from whom he receives the fullest explanation of the state and merits of the different undertakings he alludes to. Founded upon such authorities, he endeavours to give an impartial statement of the facts, and to show the grounds on which success in each case is anticipated. When changes do take place he does not fail to notice them, one of the strongest instances of which was regarding North Wheal Robert (with which the writer is himself connected), an unfavourable report on the mine by Capt. Chas. Thomas having been given at the end of June last, the inspection having been made specially for the Review."—Review, Dec. 1858, pp. 13–19.

ON THE ARTIFICIAL FORMATION OF OXYCHLORIDE OF COPPER (ATACAMITE) AND THE SULPHATES OF COPPER.—Oxides of copper and other matters carried over by the draught from some copper smelting furnaces were deposited for more than six months in the culvert or underground chimney leading to the principal stack. The bottom or floor of the culvert was not bricked, but consisted simply of the soil, underneath which were some salt springs, from which water, strongly impregnated with saline material, continually rose. The chimney was built close to the margin of the sea, and before the furnaces were lighted the horizontal floor was always very damp. Layers of some inches in thickness of the metallic dust had been deposited, and when the chimney was opened bright blue and green strata were observed, underlying the brown earthy-looking substance which was constantly exposed to the flame from the furnaces. Although the culvert had been at a full red heat for many months, the salts on the floors contained much water, many specimens being beautifully crystallised, having been protected from the flame by the continual deposition of fresh powder, and doubtless owing their formation to the action of saline substances oozing up from below upon oxide of copper at a comparatively high temperature. An analysis of one very clean specimen of the blue variety gave the following results:—34·50 per cent. was soluble in water, and with the exception of traces of chlorine gave simply sulphuric acid and oxide of copper, evidently being the ordinary sulphate. The remaining 65·50 dissolved easily in dilute nitric acid, after having been dried at a temperature of 212 deg., and gave 47·20 oxide of copper, and 18·21 sulphuric acid, corresponding very closely to the formula of a basic sulphate of the composition $3CuO, SO^3$. Other specimens had a grass-green colour, and were highly deliquescent, appearing to be mixtures of the ordinary and basic sulphates, the former partially dehydrated, and regaining its water from the air. From the rapid absorption of moisture, the anlysis was very difficult, but the soluble portion, amounting to about 40 per cent., gave equal weights of sulphuric acid and oxide of copper, and the residue proved to be highly basic. But by far the greater portion of the deposit in the chimney consisted of oxychloride of copper, having exactly the appearance, properties, and composition of the native mineral: Atacamite (100 grs.) yielded—Copper, 56·92; chlorine, 16·30; water, 16·14; or, oxide of copper, 53·11; chloride of copper, 30·73; water, 16·14; or $3CuO, CuCl—4HO$, with traces of iron and sulphuric acid. Native atacamite gives—copper, 57·13; chlorine, 16·07; water, 16·07. The oxychloride was perfectly insoluble in water, and thus could be easily separated from the soluble chlorides and sulphates, which existed in small quantities. It was entirely soluble in ammonia. More than eight tons of oxychloride, and from four to five of the sulphates were obtained. It appears from this that oxide of copper in the presence of the alkaline chlorides and sulphates at an elevated temperature, becomes entirely converted into sulphate and oxychloride. The upper stratum of the deposit consisted chiefly of oxide of copper; immediately underneath this anhydrous oxychloride, with basic sulphate, and on the floor of the chimney hydrated oxychloride with the crystallised sulphate as well as the basic salt.—By FRED. FIELD, F.R.S.E., Coquimbo, Chile: *Chemical Gaz.*

DISTILLATION OF SHALE.—Mr. C. M. Kernot, M.D., West Cowes, provisionally specified an invention, which has for its object improvements in distilling shale, boghead, and other mineral matters. For these purposes the upper part of the retort or still is formed with an outlet leading to the condenser, an opening at top with a cover, and also a side passage or opening with a cover. Between the head or top of the retort or still above mentioned is introduced a partition consisting of two perforated plates, between which when first distilling products from shale, boghead coal, or other minerals, are placed powdered coke and sand in layers, through which the evolved products pass, and are filtered in their way to the head, and thence to the condenser. When re-distilling products, such as naphtha, oils, hydrocarbons, and others, from mineral matters, then the still-head is formed at the upper part of a pipe or neck, the lower part of which descends some distance into the still or retort, but so that such lower end comes above the charge of fluid in the still or retort. Around the upper end of this neck or pipe is formed a gutter or hollow channel, into which the condensed products in the head descend, and are thereby prevented flowing back to the still or retort, but are carried off with the gases or vapours to the condenser. In the pipe or neck is placed a partition consisting of two perforated plates, between which are placed matters suitable for acting on the passing products in a chemical or mechanical manner, so as to filter such products to arrest impurities and produce chemical changes. The matters which are generally used are black oxide of manganese, sulphate of iron, chloride of potash, bichromate of potash, and others, according to the action desired to be produced on the products as they are distilled over. These matters are placed in layers between the perforated plates of the partition.

STEAM GENERATORS.—Instead of the methods now employed, Mr. T. V. Lee, of the Adelphi, constructs the generator in two compartments, and through the under portion, which alone receives the direct or sensible action of the fire, are a series of passages leading to a chamber, or series of chambers, in which coils are placed. The heat and gases passing through the passages, after acting on the under surface, heats the coil, and is fully utilised before leaving the chamber by branch flues leading to the main flue or take up, within the base of which is a chest, to which the termination of the coil is connected, and branches from this chest are furnished with suitable valves, cocks, &c. The steam generated in the under compartment is passed through the coil to the upper compartment, which is fitted in its interior with suitable piping, a portion of which is perforated for the equal diffusion of the superheated steam or hydro-caloric throughout the water, and suitable valves are placed on each compartment of the generator. Steam for power is taken from a chest upon the upper portion, and when required a jet of hydro-caloric is taken to the cylinders of the engines from the chest within the take-up.

IMPROVEMENTS IN WHEELS AND SKIDS.—Mr. W. Davis has recently specified some ingenious improvements in constructing carriage wheels to cause them to act as springs, and thus preserve the carriage and render it easy. Mr. Davis states that the stock and spokes of the wheel may be constructed in the usual manner, but at each end of the felloes a slit or opening is made about ⅛ in. thick, and 2 or 3 in. long, to admit a plate of iron or steel. Holes are then bored through the felloes and the metal-plates, so as to fix and draw the wheel firmly together by means of rivets. The ends of the spokes may be inserted in the felloes in the usual manner, or slits or openings may be made in the felloes of a suitable length and depth, and about ⅛ inch deep. A slit may also be made in the end of each spoke, and into these slits plates of metal may be inserted and fixed. A piece of metal tube of suitable shape is then firmly attached to that end of the spoke in which the metal-plate is inserted, so as to form a kind of ferrule. In the periphery of the wheel a groove or receptacle of an inverted rounding or semi-circular figure, and in the centre or bottom of the round or semi-circular groove a square or oblong groove is formed. A ring, or band of caoutchouc, vulcanised or mineralised, or caoutchouc composition, is used; the under parts of which band correspond with the grooves made in the periphery of the wheel, and lie therein by the contractive property of the caoutchouc; the upper part of the band is next, and revolves on the road when the wheel is in use. "To strengthen the wheel I affix cheeks or plates of metal to the sides of the felloes. Or, I make my improved wheels by turning a groove or channel in the periphery, and I fill this channel or groove with cork, and over the cork caoutchouc is applied to run on the road, or the cork may be put into a tube and placed in the said channel, or several tubes or rollers of caoutchouc may be inserted in a channel in the wheel to run on the road; or the channel in the wheel, as herein described, may be filled with cork, and over the cork may be driven a metal tyre. To impart a springy action to such wheels the metal tyre may be reduced in substance at intervals by filing across, or otherwise. For the caoutchouc banded wheels I make a skid hollow, or with a double bottom with a space between, so as to prevent the part next the caoutchouc from becoming hot. Or, the motion of the wheels can be retarded by attaching a screw, or lever, to a convenient part of the carriage, and to bear or press on the periphery or caoutchouc band of the wheel, the part pressing thereon being provided with a friction, so that the wheel may not be injured. For railroads I make the wheels of solid wood, with a groove in the periphery for a caoutchouc band to lie in, and with metal cheeks and plates at the sides, the inner plate forming the flange of the wheel."

STATISTICS OF THE MINING INTEREST.

BY WILLIAM HENRY CUELL, ESQ.

TABULAR STATEMENTS, WITH RETURNS OF METAL, ON DIVIDEND-PAYING MINES, FOR THE PAST YEAR (1858).

CORNISH AND DEVON MINES.

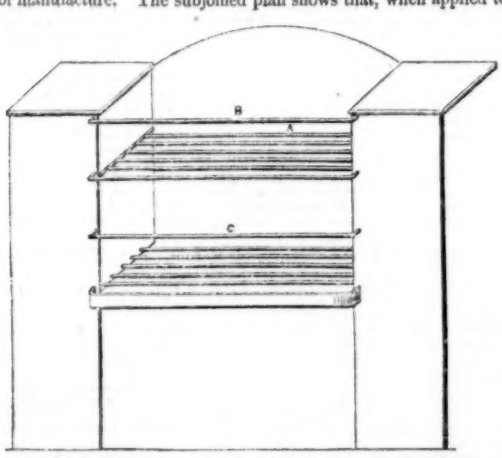
No. of Shares	Name of Mine.	Amount Paid. £. s. d.	Dividend per share. £. s. d.	Total Amount. £	Metal.	Parish.	Purser or Secretary.	Address.	System.	Dividend payable.	Copper. Tons.	Tin. Tons.	Lead. Tons.	Total Amount of Money. £ s. d.	Lease granted. In Years.	Dues.
5120	Alfred Consols (*a*)	2 10 0	0 17 0	4352	Copper	Phillack	H. Noell	Hayle	Cost-book	Two months	4206	—	—	25,686 0 0	1850 21	1-18 1-20
4000	Bedford United	2 7 6	0 11 6	2300	Copper	Tavistock	J. Laws	50, Threadneedle-street	ditto	Three months	2511	—	—	13,694 0 0	1841 21	1-15
240	Boscean	20 10 0	2 0 0	480	Tin	St. Just	S. York	Penzance	ditto	Two months	—	212	—	14,987 0 0		
200	Botallack	91 5 0	15 0 0	3000	Tin and copper	St. Just	S. H. James	St. Just	ditto	ditto	570	180	—	18,710 0 0		1-24 1-13
1000	Carn Brea	15 0 0	8 0 0	8000	Tin and copper	Illogan	F. Rochfort	Queen-street-place	ditto	ditto	2780	542	—	47,575 0 0		1-19
1055	Craddock Moor	8 0 0	1 7 0	1424½	Copper	St. Cleer	E. A. Crouch	Liskeard	ditto	ditto	1249	—	—	10,685 0 0		
1024	Devon Great Consols	1 0 0	44 0 0	45056	Copper	Tavistock	A. Allen	Gresham House	Joint-stock	ditto	23102	—	—	122,851 0 0	1844 21	1-12
4076	Devon and Cornwall	4 6 3	0 7 6	1528⅛	Copper	Tavistock	C. Wescomb	Exeter	Cost-book	ditto	1335	—	—	5,077 0 0		
358	Dolcoath (*b*)	128 17 6	21 0 0	7518	Copper and tin	Camborne	C. Thomas	Camborne	ditto	ditto	593	661	—	46,571 0 0		
2948	East Falmouth (*c*)	2 0 0	0 2 6	256	Lead	Kea	G. Down	Exeter	ditto	ditto	—	—	64	1,815 0 0		
128	East Pool (*d*)	20 10 0	10 0 0	1280	Copper and tin	Illogan	W. Prisk	Pool	ditto	ditto	1324	45	—	8,533 0 0		
5700	Exmouth	4 15 0	0 5 6	1567½	Lead	Christow	J. G. Bidwell	Exeter	ditto	ditto	—	—	1116	12,965 0 0		1-30
486	Grambler & St. Aubyn	54 15 0	11 0 0	2673	Copper	Gwennap	W. Richards	Redruth	ditto	ditto	461	—	—	8,304 0 0		1-18
6000	Great South Tolgus	2 10 0	1 18 0	11400	Copper	Redruth	W. A. Buckley	50, Threadneedle-street	ditto	ditto	3224	—	—	21,799 0 0		
1024	Herodsfoot	8 10 0	1 5 0	1274	Lead	Liskeard	J. Watson	13, George-yard, Lomb.-street	ditto	Four months	—	—	510	8,149 0 0		
160	Levant	2 10 0	14 0 0	2240	Copper and tin	St. Just	H. Borrow	Truro	ditto	Three months	1480	92	—	20,258 0 0		1-24 1-20
1024	Mary Ann	8 0 0	9 0 0	9216	Lead	Menheniot	P. Clymo, jun.	Liskeard	ditto	ditto	—	—	1397	32,323 0 0		
6000	North Basset	nil.	0 13 0	3900	Copper and tin	Illogan	J. Pascoe	50, Threadneedle-street	ditto	Two months	3266	—	—	19,952 0 0		1-15
6400	Par Consols	1 2 6	1 11 0	9920	Copper	St. Blazey	Capt. Davis	St. Blazey	ditto	Three months	3474	392	—	57,010 0 0		
200	Phœnix	30 0 0	50 0 0	10000	Copper and tin	Linkinghorne	T. Cross	Linkinghorne	ditto	ditto						
1772	Polberro	15 0 0	0 17 0	1506¼	Tin	St. Agnes	Com. of Management	Queen-street-place	ditto	ditto	—	250	—	15,763 0 0		
560	Providence	20 15 0	9 0 0	5040	Tin and copper	Uny Lelant	S. Higgs	Penzance	ditto	ditto	14	327	—	21,041 0 0		
20000	St. Day United	2 0 0	0 1 0	1000	Copper	Gwennap	E. King	Austinfriars	ditto	ditto	1753	153	—	17,308 0 0		
470	St. Ive Consols	80 0 0	5 10 0	2585	Tin	St. Ive	J. Vivian	Penzance	ditto	Four months	11	250	—	15,503 0 0	1846 21	1-[illegible]
256	South Garras	26 0 0	2 0 0	512	Lead	Kenwyn	J. Lenderyou	Truro	ditto							
496	South Frances	140 0 0	35 0 0	17360	Copper and tin	Illogan	J. Cady	Camborne	ditto	Two months	5332	14	—	36,433 0 0	1844 21	1-15
512	South Tolgus	2 10 0	5 10 0	2816	Copper	Redruth	Taylor and Sons	Queen-street-place	ditto	ditto	2425	—	—	17,153 0 0		
256	South Caradon	2 10 0	44 0 0	11264	Copper	St Cleer	T. Kitto	Liskeard	ditto	ditto	4993	—	—	51,106 0 0		1-16
6000	Tincroft	9 0 0	0 15 0	4500	Tin	Illogan	H. Williams	Moorgate-street	ditto	Three months	2183	182	—	21,808 0 0		
1040	Trelawny	9 0 0	5 0 0	5200	Silver-lead	Liskeard	J. Philp	Cornwall	ditto	ditto	—	1309	—	26,962 0 0		
512	Wendron Consols	23 7 6	1 0 0	512	Tin	Wendron	F. Hill	Helston	ditto	ditto						
6000	West Basset	5 5 0	2 6 0	13800	Copper	Illogan	J. Pascoe	Threadneedle-street	ditto	Two months	7292	11	—	42,834 0 0	1855 21	1-15
256	West Caradon	20 0 0	2 0 0	512	Copper	St. Cleer	W. J. Dunsford	Adam's-court, Old Broad-street	ditto	Three months	3699	—	—	27,396 0 0	1854 21	1-15
400	West Seton	38 7 6	43 10 0	17400	Copper	Camborne	B. Matthews	St. Day	ditto	Two months	5482	—	—	37,883 0 0		1-15
6400	West Fowey	7 0 0	0 2 6	800	Tin and copper	Tywardreath	Capt. Davis	St. Blazey	ditto	ditto	501	19	—	4,537 0 0		
240	Wheal Bal	15 0 0	1 0 0	240	Tin	St. Just	J. Carthew	Cornwall	ditto							
512	Wheal Basset	5 5 0	33 0 0	16896	Copper and tin	Illogan	W. Richards	Redruth	ditto	Two months	4792	43	—	41,543 0 0	1849 21	1-15
256	Wheal Buller	5 0 0	45 0 0	11520	Copper and tin	Redruth	S. and R. Davey	Redruth	ditto	ditto	5349	—	—	27,448 0 0	1849 21	1-16
4096	Wheal Edward	4 10 0	0 5 0	1024	Copper and tin	Calstock	E. King	Austinfriars	ditto	Three months	1542	—	—	7,260 0 0		
128	Wheal Friendship (*e*)	50 0 0	10 0 0	1280	Copper and tin	Devon	J. Taylor and Sons	6, Queen-street-place	ditto	ditto	1777	—	9	16,422 0 0		
448	Wheal Margaret	19 15 0	7 0 0	3136	Tin	Uny Lelant	T. Treweeke	St. Ive	ditto	Three months	—	292	—	17,577 0 0		1-24
80	Wheal Owles	70 0 0	10 0 0	800	Tin	St. Just	J. Boyns	St. Just	ditto	ditto						1-25
1024	Wheal Grylls	204 16 0	0 5 0	256	Tin	Breage	R. R. Michell	Marazion	ditto	ditto						

WELSH MINES.

200	Cefn Brwyno (*f*)	33 0 0	2 0 0	400	Lead	Cardigan	J. Taylor and Sons	6, Queen-street-place	Cost-book		—	—	320	4,572 0 0		
128	Cwmystwith	60 0 0	50 0 0	6400	Lead	Cardigan	J. Taylor and Sons	6, Queen-street-place	ditto	Three months	—	—	1321	18,523 0 0		
867	Cwm Erfin	7 10 0	0 10 0	433½	Lead	Cardigan	J. Taylor and Sons	6, Queen-street-place	ditto							
300	East Daren	32 0 0	18 0 0	5400	Lead	Cardigan	J. Taylor and Sons	6, Queen-street-place	ditto	Three months	—	—	957	15,297 0 0		
400	Lisburne (*g*)	18 15 0	13 0 0	5200	Lead	Cardigan	J. Taylor and Sons	6, Queen-street-place	ditto	ditto	—	—	2133	30,353 0 0		
1800	Minera (*h*)	25 0 0			Lead	Wrexham	J. Darlington	Denbighshire	ditto	ditto	—	—	3169	47,127 0 0		
2500	Rhoswydol	11 5 0	0 7 0	750	Lead	Machynlleth	G. Hadley	Old Jewry	ditto	ditto	—	—	318	4,254 0 0		
20000	Vale of Towy	0 12 6	0 2 0	2000	Lead	Carmarthen	T. Field, jun.	Crown-ct., Threadneed.-street.	ditto	ditto	—	—	825	10,067 0 0		1-12

(*a*)—The returns include 200*l.* for jack and blende.
(*b*)—The returns include 150*l.* for arsenic.
(*c*)—The returns include 100*l.* for jack.
(*d*)—The returns include 140*l.* for arsenic.
(*e*)—The returns include 200 tons of arsenic and 160 tons of blende.
(*f*)—The returns include 170*l.* for jack.
(*g*)—The returns include 360*l.* for blende.
(*h*)—The returns include 885 tons blende.

ECONOMY IN COAL.—The new smoke-consuming patent of Dr. Bartlett, of King's-road, Bedford-row, suggests an alteration in the manner of stoking fires, particularly furnaces, with the view of effecting a saving in the consumption of fuel. Instead of placing green coal on the top of the burning fire, Dr. Bartlett, by an ingenious contrivance, places it underneath, thereby securing that the smoke must pass through the fire, by which means the smoke is utilised, instead of being wasted. Those practically acquainted with the stoking of large fires know well that the gases given off from the coal contain the great heating principle, and, therefore, in utilising the smoke this invention is of interest, especially when we consider that the expense of coal forms an important item in the calculation of the cost of manufacture. The subjoined plan shows that, when applied to an



ordinary grate, a horizontal grating, *a*, divides the fire-place into two compartments, *b* and *c*, and the fire-bars of the lower compartment, *c*, are made to move, so that coal may be readily introduced into that part of the fire-place. The fire is lighted in the upper compartment, *b*, and after it has burnt up, the lower compartment, *c*, is opened by moving its fire-bars, and the fresh fuel is readily introduced by an ordinary fire shovel into the lower compartment. When the fire needs replenishing, the lower compartment, *c*, is opened, the well-ignited fuel is removed by the aid of a shovel from the lower to the upper compartment, and the lower compartment is then again supplied with fresh coal. By making a side hopper or fuel chamber, the fuel is readily introduced from the top, and in that case the fire-bars need no alteration. This invention is very simple, of easy application, durable, requires little attention, and effects a saving of 50 per cent. of coal. Dr. Bartlett has various modifications of his apparatus, to render it suitable to different purposes.

*** Now Ready, price One Shilling, THE PROGRESS OF MINING IN 1858. By J. Y. WATSON, F.G.S., being the Fifteenth Annual Review. To be had at the *Mining Journal* office, 26, Fleet-street; of Messrs. Watson and Cuell, St. Michael's-alley, Cornhill; or through any bookseller or newsman in town or country.

Works published at the MINING JOURNAL *office, 26, Fleet-street, London.*

PRACTICAL TREATISE ON MINE ENGINEERING. By G. C. GREENWELL. In one vol., half-bound, £2 15s.; whole bound in Morocco, £3 10s. In two vols., half-bound, £3 3.

TREATISE ON IRON METALLURGY. By S. B. ROGERS. £1 5s.

NEW GUIDE TO THE IRON TRADE, OR MILL MANAGERS' AND STOCK-TAKERS' ASSISTANT. By JAMES ROSE. 8s. 6d.

TRANSACTIONS OF THE NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS. Six volumes: 21s. per volume.

THE COST-BOOK—TAPPING'S PRIZE ESSAY—WITH NOTES AND APPENDIX. 5s.

TAPPING'S EXPOSITION OF THE JOINT-STOCK COMPANIES ACT. 4s.

GEOLOGY AND MINING—FOUR LECTURES, by G. HENWOOD, 2s. 6d.: by post 3s.

INVENTIONS, IMPROVEMENTS, AND PRACTICE, OF A COLLIERY ENGINEER AND GENERAL MANAGER. By BENJAMIN THOMPSON. 6s.

TAPPING'S DERBYSHIRE MINING CUSTOMS. 6s.

TAPPING'S HIGH PEAK MINING CUSTOMS. 5s.

TAPPING'S EDITION OF MANLOVE'S CUSTOMS OF THE LEAD MINES OF DERBYSHIRE. 3s.

PLAN OF VENTILATING COAL MINES. By WM. HOPTON. 3s.

SOUTH WALES INSTITUTE OF ENGINEERS. Parts I., II., and III. 2s. 6d. each.

N COPPER SMELTING. By HYDE CLARKE, C.E. 1s.

A NEW ERA IN IRON METALLURGY.
Just published, with 20 plates, price 25s.,
ELEMENTARY TREATISE ON IRON METALLURGY,
UP TO THE MANUFACTURE OF PUDDLED BARS:
Built upon the Atomic System of Philosophy, the Elements operated upon being Estimated according to Dr. Wollaston's Hydrogen Scale of Equivalents.
Comprising Suggestions relative to Important Improvements in the Manufacture of Iron and Steel, and the Conduct of extensive Ironworks.
WITH ANALYTICAL TABLES OF IRON-MAKING MATERIALS.
By SAMUEL BALDWYN ROGERS, of Naut-y-glo, Monmouthshire.
"I do not hesitate to say Mr. Rogers's work is the most complete combination of sound science and sound practice that has yet appeared on Iron—beyond comparison."—DAVID MUSHET. London: *Mining Journal* office, 26, Fleet-street. 141

COMPULSORY REGISTRATION OF JOINT-STOCK COMPANIES.
Now ready, price 4s., the Second Edition of
TAPPING'S EXPOSITION OF THE JOINT-STOCK COMPANIES ACTS OF 1856 AND 1857.
Designed as a PRACTICAL GUIDE for the Promoters, Directors, Shareholders, Solicitors, Secretaries, Officers, and Creditors of all kinds of Joint-Stock Companies.
Containing a Clear Exposition of the recently passed JOINT-STOCK COMPANIES ACT, 1857.
Also, full Directions for the Formation, Registration, and Incorporation, of Joint-Stock Companies, together with the Authorised Regulations for Management of the same, and all necessary forms.
By THOMAS TAPPING, Esq., Barrister-at-law.
Author of the *Readwin Prize Essay on the Cost Book System*, &c., &c.
London: *Mining Journal* office, 26, Fleet-street; and all booksellers. 142

Just published, Vol. VI., price 21s.,
TRANSACTIONS OF THE NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS.
This volume contains:—Remarks on the Ore and Ironstone of Rosedale Abbey, by Mr. Jos. Bewick. On the Coal Field of New South Wales, by Mr. H. T. Plews. Notes on the Production and Consumption of Coal in France, by Mr. T. Y. Hall. On the Lemielle System of Ventilating Mines, by Mr. Laurent. On the Comparative Consumption of Fuel, by Mr. J. J. Atkinson. On the Proportions in which Air in Mines Distributes Itself, by Mr. J. J. Atkinson. On the Lund Hill Accident, and on the Ventilation of Mines Generally, by Mr. John Wales.
London: *Mining Journal* office, 26, Fleet-street, London, E.C. 143

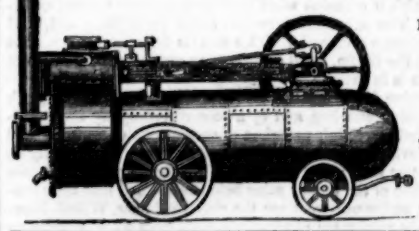
INVESTMENTS IN BRITISH MINES.
Full particulars of the most important Dividend and Progressive Mines will be found in the Fourth Edition of
BRITISH MINES CONSIDERED AS AN INVESTMENT,
Recently published, by J. H. MURCHISON, F.G.S., F.S.S.
Pp. 356; price 3s. 6d., by post, 4s.
Mr. MURCHISON also publishes a QUARTERLY REVIEW OF BRITISH MINING, giving, at the same time, the Position and Prospects of the Mines at the end of each quarter, the Dividends Paid, &c.; price 1s. Reliable information and advice will at any time be given by Mr. MURCHISON, either personally or by letter, at his offices, No. 117, Bishopsgate-street Within, London, where copies of the above publications can be obtained.
OPINIONS OF THE PRESS.
Mr. Murchison's new work on British Mines is attracting a great deal of attention, and is considered a very useful publication, and calculated to considerably improve the position of home mine investments.—*Mining Journal.*
The book will be found extremely valuable.—*Observer.*
A valuable little book.—*Globe.*
A valuable guide to investors.—*Herapath.*
Mr. Murchison takes sound views upon the important subject of his book, and has placed, for a small sum, within the reach of all persons contemplating making investments in mining shares that information which should prevent rash speculation and unproductive outlay of capital in mines.—*Morning Herald.*
Of special interest to persons having capital employed, or who may be desirous of investing in mines.—*Morning Chronicle.*
Parties requiring information on mining investments will find no better and safer instructor than Mr. Murchison.—*Leeds Times.*
As a guide for the investment of capital in mining operations is inestimable. One of the most valuable mining publications which has come under our notice, and contains more information than any other on the subject of which it treats.—*Derby Telegraph.*
To those who wish to invest capital in British Mines, this work is of the first importance.—*Welshman.*
This work enables the capitalist to invest on sound principles; it is, in truth, an excellent guide.—*Plymouth Journal.*
Persons desirous to invest their capital in mining speculations, will find this work a very useful guide.—*Warwick Advertiser.*
It is full of carefully compiled and reliable information relative to all the known mine in the United Kingdom.—*Sheffield Free Press.*
Those interested in mining affairs, or who are desirous of becoming speculators, should obtain and carefully peruse the work.—*Monmouth Beacon.*
Every person connected, or who thinks of connecting himself, with mining speculations should possess himself of this book.—*North Wales Chronicle.*
A very valuable book.—*Cornwall Gazette.* [*Glasgow Examiner.*
All who have invested, or intend to invest, in mines should peruse this able work.
We believe a more useful publication, or one more to be depended on, cannot be found.—*Plymouth Herald.*
With such a work in print, it would be gross neglect in an investor not to consult it before laying out his capital.—*Poole Herald.*
Mr. Murchison will be a safe and trustworthy guide, so far as British Mines are concerned.—*Bath Express.*
Is deserving the attention of every one who seeks profitable investment of his capital.—*Brighton Examiner.*
This is really a practical work for the capitalist.—*Stockport Advertiser.*
All who have invested, or intend to invest, in mines, would do well to consult this very useful work.—*Ipswich Express.*
Of great value to capitalists.—*Sunderland Times.*
To capitalists the work will prove very serviceable.—*Birmingham Mercury.*
144

BRICKS.—Messrs. OATES AND INGRAM inform brick makers on an extensive scale that their PATENT SOLID BRICK MACHINE is now THOROUGHLY and EFFICIENTLY TESTED, and are prepared to OFFER the following counties to the trade, in districts, either by ROYALTY or PURCHASE:—Middlesex, Surrey, Sussex, Essex, Kent, Norfolk, Suffolk, Cambridge, Oxford, Gloucester, Hertford, Berks, Bucks, Huntingdon, Devon, Cornwall, Dorset, Wilts, Hants, and Isle of Wight.
With this PATENT MACHINE the ordinary surface clay requires no preparation whatever, whilst that of a rocky nature has merely to be passed through rollers in the usual way, AND THENCE, WITHOUT ANY TEMPERING, INTO THE MACHINE, FROM WHICH THE BRICKS ARE REMOVED DIRECT TO THE KILN IN A STATE READY FOR BURNING.
The MACHINE is now making UPWARDS OF THIRTY BRICKS PER MINUTE at the works of Messrs. KIRK and PARRY, Government contractors, Fort Elson, near Gosport; and also at the Patent Solid Brick Works of T. WELLS INGRAM, Oldbury, near Birmingham.
Application for orders to see the machine in operation to be made to Messrs. OATES and INGRAM, Bradford-street, Birmingham. Samples of clay may be sent and passed through the machine, and the bricks burnt, or a sample brick will be sent to any party wishing to see one.

MESSRS. KNOWLES AND BUXTON, CHESTERFIELD,
MANUFACTURERS OF PATENT TUBULAR TUYERES

Ordinary size, 16 in. long, 30s. each; extra ditto, 20 in. long, 35s. each; large ditto, 22 in. long, 40s. each; extra large ditto, 24 in. long, 45s. each; 1s. each extra for socket. Delivered at Chesterfield station. Terms, nett cash quarterly. 145

HULL FORGE. BEST SCRAP
HULL FORGE.
ALLOTT AND THELWALL, HULL FORGE, HULL, are prepared to supply RIVET, BAR, NUT, and ANGLE IRON, SHAFTINGS, FORGINGS, USES, &c., made entirely from scrap iron, on reasonable terms, and on the shortest notice. The superior quality of the Hull Forge iron is well known, and has been extensively used where quality is of importance.—Hull Forge, Nov. 8, 1858.

MINING STEAM ENGINES,
TO BE LET ON HIRE, OR FOR SALE,
PATENT PORTABLE STEAM-ENGINES,
From 6 to 20-horse power, & upwards,
SUITABLE FOR
PUMPING, WINDING AND WORKING MACHINERY GENERALLY.

Apply to
T. CRESSWELL, Engineer
No. 92, Blackfriars-road,
WHERE THEY MAY BE SEEN. 146

HALEY'S PATENT LIFTING JACK,
MANUFACTURED BY THE INVENTOR,
JOSEPH HALEY,
ALBION STREET, GAYTHORN, MANCHESTER.
SCREW JACKS, SHIP JACKS.
SLIDE AND CENTRE LATHES, PLANING, SHAPING, BORING, DRILLING SCREWING, WHEEL CUTTING, AND OTHER MACHINES.
RIVET MAKING MACHINES. 147

LONDON: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their office, No. 26, FLEET-STREET, where all communications are requested to be addressed. [*Feb.* 12, 1859.